87.   The network of claim 86,

further is always capable of setting up said connection by never changing path of a

previously set up multicast connection, and the network is hereinafter "strictly

nonblocking network".

5   88.   The network of claim 85 comprising a controller in communication with said

input, output and middle stages to set up said multicast connection.

89.   The network of claim 86 wherein said r_1 input switches and r_2 output switches

are the same number of switches.

90.   The network of claim 86 wherein said n_1 inlet links and n_2 outlet links are the

10   same number of links and $n_1 = n_2 = n$, then $m \geq 3 * n - 1$.

91.   The strictly nonblocking network of claim 87,

wherein each of said input switches, or each of said output switches, or each of

said middle switches further recursively comprise one or more strictly nonblocking

networks.

15   92.   The network of claim 85,

wherein each of said input switches, or each of said output switches, or each of

said middle switches further recursively comprise one or more networks.

93.   A network having a plurality of multicast connections, said network comprising:

an input stage comprising r_1 input switches and n_1 inlet links for each of said r_1

20   input switches, and $N_1 = n_1 * r_1$;

an output stage comprising r_2 output switches and n_2 outlet links for each of said

r_2 output switches, and $N_2 = n_2 * r_2$; and

a middle stage comprising m middle switches, and each middle switch

comprising at least one link connected to each input switch for a total of at least r_1 first

25   internal links; each middle switch further comprising at least one link connected to at

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most d said output switches for a total of at least d second internal links, wherein $1 \le d \le r_2$,

wherein each multicast connection from an inlet link passes through at most three middles switches, and said multicast connection further passes a plurality of outlet links from said at most three middle switches.

94. The network of claim 93, wherein $m \ge 3 * n_1 + n_2 - 1$,

95. The network of claim 94,
further is always capable of setting up said connection by never changing path of a previously set up multicast connection, and the network is hereinafter "strictly nonblocking network".

96. The network of claim 93 comprising a controller in communication with said input, output and middle stages to set up said multicast connection.

97. The network of claim 94 wherein said r_1 input switches and r_2 output switches are the same number of switches.

98. The network of claim 94 wherein said n_1 inlet links and n_2 outlet links are the same number of links and $n_1 = n_2 = n$, then $m \ge 4 * n - 1$.

99. The strictly nonblocking network of claim 95,
wherein each of said input switches, or each of said output switches, or each of said middle switches further recursively comprise one or more strictly nonblocking networks.

100. The network of claim 93 ,
wherein each of said input switches, or each of said output switches, or each of said middle switches further recursively comprise one or more networks.

101. A network having a plurality of multicast connections, said network comprising:

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an input stage comprising r_1 input switches and n_1 inlet links for each of said r_1 input switches, and $N_1 = n_1 * r_1$;

an output stage comprising r_2 output switches and n_2 outlet links for each of said r_2 output switches, and $N_2 = n_2 * r_2$; and

5   a middle stage comprising m middle switches, and each middle switch comprising at least one link connected to each input switch for a total of at least r_1 first internal links; each middle switch further comprising at least one link connected to at most d output switches for a total of at least d second internal links, wherein $1 \leq d \leq r_2$, for $2 \leq x \leq r_2$,

10   wherein each multicast connection from an inlet link passes through at most x middles switches, and said multicast connection further passes a plurality of outlet links from said at most x middle switches.

102.   The network of claim 101, wherein $m \geq x * n_1 + n_2 - 1$.

103.   The network of claim 102,

15   further is always capable of setting up said connection by never changing path of a previously set up multicast connection, and the network is hereinafter "strictly nonblocking network".

104.   The network of claim 101 comprising a controller in communication with said input, output and middle stages to set up said multicast connection.

20   105.   The network of claim 102 wherein said r_1 input switches and r_2 output switches are the same number of switches.

106.   The network of claim 102 wherein said n_1 inlet links and n_2 outlet links are the same number of links and $n_1 = n_2 = n$, then $m \geq (x+1) * n$.